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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,237	01/14/2004	Jimmie Earl DeWitt JR.	AUS920030550US1	3251
35525	7590	04/19/2006	EXAMINER	
IBM CORP (YA)			LAI, VINCENT	
C/O YEE & ASSOCIATES PC				
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DALLAS, TX 75380			PAPER NUMBER	
			2181	

DATE MAILED: 04/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/757,237	<b>Applicant(s)</b> DEWITT ET AL.	
	<b>Examiner</b> Vincent Lai	<b>Art Unit</b> 2181	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1/14/2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/14/2004.

- 4) ☐ Interview Summary (PTO-413) 4/14/2006  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

*Fritz Fleming*  
Supervisory  
FRITZ FLEMING  
PRIMARY EXAMINER  
GROUP 2100  
4/14/2006

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The information disclosure statement (IDS) submitted on 1/14/2004 was considered by the examiner.

### ***Drawings***

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Element 260 of figure 2. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

3. The disclosure is objected to because of the following informalities:

The cross-reference to related applications section of the specification is incomplete.

Appropriate correction is required.

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Autonomic method and apparatus for counting branch instructions to generate branch statistics meant to improve branch predictions."

#### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8-14, and 16-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The preamble of claim 8 relates to a computer system whereas the claimed subject matter of the claim (and all dependent claims) relate to a branch prediction apparatus, which alone is not a computer system. It is unclear as to whether the claimed subject matter is a computer system with the branch prediction apparatus or simply a branch prediction apparatus.

Claims 9-14 are rejected for its dependency on claim 8.

Claims 16-18 are apparatus claims that detail storage of data in "branch statistic fields," which appear to be more of conceptual ideas of organizing data instead of actual physical components/parts of the apparatus. It is unclear as to what is meant by when an apparatus has a "branch statistic field."

***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 1-7 and 15-21 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. There are no tangible end results from implementing the claims in question because the end result is a determination, which lacks a tangible "real world" result. Although some claims do have intermediate steps that produce an intermediate tangible result, the end result still lacks tangibility. Such steps include predicting and counting.

It is of note that claims 7 and 21 are interpreted implementing a counting action, which is non-statutory subject matter, despite the fact that an execution of a computer program is mentioned.

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4/14/2006  
Claims ~~1-7 and~~ 15-21 also are directed to non-statutory subject matter because of an improper definition of acceptable computer readable media. Such forms of

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unacceptable computer readable media include the disclosed "radio frequency and light wave transmissions" detailed on page 27 in the submitted specification.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Holmberg (U.S. Patent # 6,233,679 B1), herein known as Holmberg.

As per claim 1, Holmberg discloses a method of performing branch prediction (See column 3, lines 35-37: Branch prediction is the main purpose of the Holmberg invention) in a computer program, comprising the steps of:

associating one or more hardware counters with one or more branch instructions (See column 4, lines 56-63: Multiple counters are used—each for counting various actions);

using the one or more hardware counters, autonomically counting branch instructions that are executed to generate branch statistics (See column 4, lines 64-65: Counters are used from providing statistics);

predicting branches to be taken using the branch statistics (See column 4, lines 64-65: Counter statistics are used to set branch prediction bits).

As per claim 2, Holmberg discloses wherein the one or more branch instructions are associated with one or more branch statistics (See column 4, line 54-column 5, line 2: Three types of counts are counter), and wherein the branch statistics are stored in one or more branch statistic fields (See figure 2, element 121 and column 4, lines 46-52: The branch statistics are saved in special registers).

As per claim 3, Holmberg discloses wherein the branch statistic fields store a plurality of data on an associated branch instruction (See column 4, lines 56-63: Multiple counters are used—each for counting various actions), wherein a first datum of the plurality of data is accessed for branch prediction when the program is in a first mode (See column 5, lines 35-43: First mode is branch predicted to be taken), and wherein a second datum of the plurality of data is accessed for branch prediction when the program is in a second mode (See column 5, lines 35-44: Second mode is branch predicted to be not taken).

As per claim 4, Holmberg discloses wherein the branch statistic fields include a branch count per instruction field that represents the number of times a branch is taken for that instruction (See column 4, lines 64-67: Statistics count number of times a branch is taken).

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As per claim 5, Holmberg discloses wherein upon occurrence of a predetermined event, the computer program switches branch prediction operating modes on a conditional branch instruction (See figure 3, and column 5, lines 35-44: A new prediction is made if a counter threshold is passed).

As per claim 6, Holmberg discloses wherein the branch statistics are stored in a performance instrumentation shadow cache (See column 4, lines 47-55: The shadow cache is known as the Measured Address Register (MAR)).

As per claim 7, Holmberg discloses wherein branches per instruction are counted during execution of the computer program (See column 4, line 64-column 5, line 2: The total number of branches is one of the counts tracked).

As per claim 8, Holmberg discloses a computer system, comprising:  
one or more hardware counters associated with one or more branch instructions of a program (See column 4, lines 56-63: Multiple counters are used—each for counting various actions);

one or more branch statistic fields for storing branch statistics associated with the one or more branch instructions (See column 4, line 54-column 5, line 2: Three types of counts are counter);

wherein when a branch instruction is executed in the program, a hardware counter of the one or more hardware counters autonomically updates a branch statistic



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in a branch statistic field (See figure 3, and column 5, lines 35-44: The branch prediction mechanism is set up to track statistics and changes predictions automatically).

As per claim 9, Holmberg discloses wherein the branch statistics are used to make branch predictions in the program (See column 4, lines 64-65: Counter statistics are used to set branch prediction bits).

As per claim 10, Holmberg discloses further comprising a plurality of operating modes of the program, wherein for a first branch instruction, an associated branch statistics field stores first branch statistics for a first mode of the plurality (See column 5, lines 35-43: First mode is branch predicted to be taken), and second branch statistics for a second mode of the plurality (See column 5, lines 35-44: Second mode is branch predicted to be not taken).

As per claim 11, Holmberg discloses wherein the branch statistic fields include a branch count per instruction field that represents the number of times a branch is taken for that instruction (See column 4, lines 64-67: Statistics count number of times a branch is taken).

As per claim 12, Holmberg discloses wherein upon occurrence of a predetermined event, the program switches branch prediction operating modes on a

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conditional branch instruction (See figure 3, and column 5, lines 35-44: A new prediction is made if a counter threshold is passed).

As per claim 13, Holmberg discloses wherein the branch statistics are stored in a performance instrumentation shadow cache (See column 4, lines 47-55: The shadow cache is known as the Measured Address Register (MAR)).

As per claim 14, Holmberg discloses wherein branches per instruction are counted during execution of the program (See column 4, line 64-column 5, line 2: The total number of branches is one of the counts tracked).

As per claim 15, Holmberg discloses a computer program product in a computer readable medium, comprising:

first instructions for associating one or more hardware counters with one or more branch instructions (See column 4, lines 56-63: Multiple counters are used—each for counting various actions);

using the one or more hardware counters, second instructions for autonomically counting branch instructions that are executed to thereby generate branch statistics (See column 4, lines 64-65: Counters are used from providing statistics);

third instructions for predicting branches to be taken using the branch statistics (See column 4, lines 64-65: Counter statistics are used to set branch prediction bits).

As per claim 16, Holmberg discloses wherein the one or more branch instructions are associated with one or more branch statistics (See column 4, line 54-column 5, line 2: Three types of counts are counter), and wherein the branch statistics are stored in the one or more branch statistic fields (See figure 2, element 121 and column 4, lines 46-52: The branch statistics are saved in special registers).

As per claim 17, Holmberg discloses wherein the branch statistic fields store a plurality of data on an associated branch instruction (See column 4, lines 56-63: Multiple counters are used—each for counting various actions), wherein a first datum of the plurality of data is accessed for branch prediction when the program is in a first mode (See column 5, lines 35-43: First mode is branch predicted to be taken), and wherein a second datum of the plurality of data is accessed for branch prediction when the program is in a second mode (See column 5, lines 35-44: Second mode is branch predicted to be not taken).

As per claim 18, Holmberg discloses wherein the branch statistic fields include a branch count per instruction field that represents the number of times a branch is taken for that instruction (See column 4, lines 64-67: Statistics count number of times a branch is taken).

As per claim 19, Holmberg discloses wherein upon occurrence of a predetermined event, the computer program switches branch prediction operating

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modes on a conditional branch instruction (See figure 3, and column 5, lines 35-44: A new prediction is made if a counter threshold is passed).

As per claim 20, Holmberg discloses wherein the branch statistics are stored in a performance instrumentation shadow cache (See column 4, lines 47-55: The shadow cache is known as the Measured Address Register (MAR)).

As per claim 21, Holmberg discloses wherein branches per instruction are counted during execution of the computer program (See column 4, line 64-column 5, line 2: The total number of branches is one of the counts tracked).

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents are cited as being related to the art of autonomic method and apparatus for counting branch instructions to generate branch statistics meant to improve branch predictions:

U.S. Patent # 5,051,944 to Fetterolf et al shows a computer address analyzer having a counter and memory locations each storing count value indicating occurrence of corresponding memory address.

U.S. Patent # 5,142,634 to Fite et al shows branch prediction utilizing history.

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U.S. Patent # 5,394,529 to Brown, III et al shows a branch prediction unit for high-performance processors utilizing counters in a scoreboard branch prediction methodology.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vincent Lai whose telephone number is (571) 272-6749. The examiner can normally be reached on M-F 8:00-5:30 (First BiWeek Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Fritz M. Fleming can be reached on (571) 272-4145. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Vincent Lai  
Examiner  
Art Unit 2181

vi  
April 4, 2006

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